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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,744	07/31/2003	Hiroto Yukawa	2003-1079	9935

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EXAMINER	
LEE, SIN J	

ART UNIT	PAPER NUMBER
1752	

DATE MAILED: 05/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/630,744	YUKAWA ET AL.	
	Examiner	Art Unit	
	Sin J. Lee	1752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *8-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 10/126,673.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *07312003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicants canceled claims 1-7 in the preliminary amendment filed on July 31, 2003.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 8-13 and 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura et al (5,759,739) in view of Yoshimoto et al (EP 0 540 032 A1) and Suwa et al (6,187,504 B1).

Takemura teaches (col.1, lines 10-12, col.2, lines 27-35) a positive resist composition of chemically amplified type comprising an alkali-soluble resin, a dissolution inhibitor of the formula (2) or (3), and a photoacid generator. The chemical formula for Takemura's photoacid generator is $(R^1)_nMX$ wherein M is *sulfonium or iodonium*, and X is p-toluenesulfonate or *trifluoromethanesulfonate* (see col.2, lines 40-48). Since there are only two choices for 'X", one of ordinary skill in the art would immediately envisage X to be trifluoromethanesulfonate anion. Therefore, the prior art teaches *present acid-generating compound which is an onium salt compound having a fluoroalkylsulfonate as the anionic constituent*. Takemura teaches (col.5, lines 36-65, col.6, lines 39-45) that their dissolution inhibitor of formula (2) can be readily prepared by copolymerizing hydroxystyrene, substituted or unsubstituted styrene, t-butyl (meth)acrylate, and

(meth)acrylic acid at a molar ratio of m:x:y:z. Based on this teaching, one of ordinary skill in the art would immediately envisage Takemura's dissolution inhibitor being a copolymer of hydroxystyrene, unsubstituted styrene, *t-butyl (meth)acrylate* (the molar ratio z for the (meth)acrylic acid monomer unit can be zero). Therefore, the prior art teaches *present copolymeric resin of claim 18 consisting of the monomeric units of hydroxystyrene, styrene, and an ester of (meth)acrylic acid (and thus also teaches the present film-forming resinous compound of claim 8).* As to the presently claimed amount for the present components (A) and (B), Takemura teaches (col.6, lines 46-48) that their dissolution inhibitor is used in the amount of 7-40% by weight of the total weight of their components and that their photoacid generator is used in the amount of 0.5-15% by weight of the total weight of their components (see col.5, lines 1-3). Based on this teaching, one of ordinary skill in the art would immediately envisage using 40% by weight of Takemura's dissolution inhibitor of formula (2) because 40% by weight is clearly included as the higher end of the taught range. When one converts the amount of 0.5-15% by weight of Takemura's photoacid generator based on 100% by weight of Takemura's dissolution inhibitor, this gives 1.25-37.5% by weight of Takemura's photoacid generator based on 100% by weight of Takemura's dissolution inhibitor. Since this range overlaps with present range of 1-20 parts by weight of the acid generating compound (B), the prior art's teaching would render present range *prima facie* obvious. In the case "where the [claimed] ranges overlap or lie inside ranges disclosed by the prior art," a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Wertheim, 541 F.2d 257, 191

USPQ 90 (CCPA 1976). Therefore, Takemura teaches present components (A) and (B) of claim 8.

With respect to present component (C), Yoshimoto et al, a prior art which also teaches a positive type photoresist composition comprising a resin having anti-alkali dissolution groups in the molecules (which becomes alkali soluble by a reaction with acid) and a photoacid generating compound, teaches in pg.3, lines 16-24 that the adhesiveness of a resist to a substrate is markedly improved by adding organic phosphorus acid compound to the photoresist in an amount of 0.001 to 10% by wt (based on the weight of the resin). As *preferred* examples for the organic phosphorus compound, Yoshimoto teaches (pg.9, lines 43-45) phenylphosphinic acid as well as phenylphosphonic acid (see Table 1 on pg.16). Since Takemura teaches (col.9, lines 25-28) that their resist compositions are coated on a silicon substrate (Yoshimoto also teaches a silicon substrate – see pg.10, lines 15-16), it would have been obvious to one of ordinary skill in the art to add an organic phosphorus acid compound such as phenylphosphinic acid or phenylphosphonic acid to Takemura's photoresist in order to improve the adhesiveness of the resist to a substrate as taught by Yoshimoto et al. Also, since the taught amount for the phosphorus acid compound to be added overlaps with the presently claimed ranges (0.01 to 5 parts by wt. in claim 8), the prior art range would have made the present ranges *prima facie* obvious. In re Wertheim, supra. Therefore, Takemura in view of Yoshimoto would render obvious present component (C) of claim 8.

With respect to present component (D), Suwa et al, a prior art which teaches (col.2, lines 14-55) a positive-tone radiation sensitive resin composition comprising a photoacid generator, alkali-soluble resin and an alkali solubility control agent, teaches (col.28, lines 30-58) the use of a Lewis base additive (which exhibits an action as a Lewis base to the acid produced from the acid generator) such as nitrogen-containing basic compounds in order to improve perpendicularity of resist pattern side walls. Since Takemura's photoresist composition also comprises a photoacid generator, it would have been obvious to one of ordinary skill in the art to add a nitrogen-containing basic compound to Takemura's resist composition in order to improve perpendicularity of resist pattern side walls as taught by Suwa et al. As examples for the nitrogen-containing basic compounds, Suwa et al teach amine compounds, imidazole compounds, pyridine compounds and nitrogen-containing heterocyclic compounds, and Suwa et al include triethylamine, tributylamine, as well as triethanolamine as more specific examples for the amine compound. It would have been obvious to one of ordinary skill in the art to add triethylamine, tributylamine, or triethanolamine into Takemura's resist composition in order to obtain the improved perpendicularity of resist pattern side walls as taught by Suwa et al. Therefore, Takemura in view of Suwa would render obvious present component (D) of claim 8 (since Suwa teaches (col.28, lines 59-61) the amount of the Lewis base additive, which exhibits an action as a Lewis base to the acid produced from the acid generator to be 0.05-1 mol for 1 mol of the acid generator, it is the Examiner's position that the prior art teaches the use of present component (D) in an amount sufficient to exhibit an acid quenching effect).

Takemura spin-coats his resist composition solution on a *silicon substrate* (present semiconductor wafer of claim 12) and pre-bake it at 100°C on a hot plate for 2 minutes to form a dried resist film. Then, by using a KrF excimer laser, a pattern is drawn on the resist film. After that, the resist film is developed to obtain a positive pattern (see Example 1). Therefore, Takemura in view of Yoshimoto et al and Suwa et al would render obvious present inventions of claims 8, 9, 12, 13, 17, 21, and 22.

With respect to present claims 10 and 11, Takemura teaches (col.2, lines 37-40) that his positive resist composition is highly sensitive to high energy radiation such as deep UV rays, electron rays, and X rays. Therefore, one of ordinary skill in the art would immediately envisage using electron rays or X rays in Takemura's imagewise exposure step. Therefore, Takemura in view of Yoshimoto and Suwa would render obvious present inventions of claims 10 and 11.

With respect to present claims 18-20, in col.5, lines 36-65, Takemura teaches that the molar ratio m (for the hydroxystyrene monomer unit) can preferably be 0.3-0.7 (30-70 % by moles), the molar ratio x (for the substituted or unsubstituted styrene monomer unit) can preferably be 0-0.9 (0-90 % by moles), and the molar ratio y (for the t-butyl (meth)acrylate monomer unit) can preferably be 0-0.9 (0-90% by moles). Since these molar ratios (or mole percentages) overlap with present ranges of claim 18, the prior art's teaching would render present ranges of claim 18 *prima facie* obvious. See In re Wertheim, supra. Therefore, Takemura in view of Yoshimoto and Suwa would render obvious present inventions of claims 18-20.

4. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura et al (5,759,739) in view of Yoshimoto et al (EP 0 540 032 A1) and Suwa et al (6,187,504 B1) as applied to claim 12 above, and further in view of applicants' admitted prior art (pg.3 of present specification).

As discussed above in Paragraph 3, Takemura applies his resist composition solution on a *silicon substrate* (present semiconductor wafer of claim 12). In the first full paragraph of pg.3 of present specification, applicants admit that it is *usual* that the photoresist layer is formed not directly on the surface of a semiconductor silicon wafer but on the surface of a thin undercoating film of materials, which examples include phosphosilicate glass, borosilicate glass, borophosphosilicate glass, SiN, Si_3N_4, and SiON. Therefore, it would have been obvious to one of ordinary skill in the art to coat Takemura's silicon substrate with a thin undercoating film of materials (such as phosphosilicate glass, borosilicate glass, borophosphosilicate glass, SiN, Si_3N_4, or SiON) before applying his resist composition solution because it is an usual practice in the art to do so as admitted by applicants. Therefore, Takemura et al in view of Yoshimoto et al and Suwa et al, and further in view of applicants' admitted prior art would render obvious present inventions of claims 14-16.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F. Huff, can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. J. L.

S. Lee
May 12, 2004

Sin J. Lee

Sin J. Lee
Patent Examiner
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